Đã bắt đầu vào lúc	Thứ hai, 26 Tháng chín 2022, 2:28 PM
Tình trạng	Đã hoàn thành
Hoàn thành vào lúc	Thứ bảy, 15 Tháng mười 2022, 8:39 PM
Thời gian thực hiện	19 ngày 6 giờ
Điểm	6,00/6,00
Điểm	**10,00** của 10,00 (**100**%)

Câu hỏi 1

Chính xác

Điểm 1,00 của 1,00

Implement methods **add, size** in template class **DLinkedList (which implements List ADT)** representing the doubly linked list with type T with the initialized frame. The description of each method is given in the code.

```
template <class T>
class DLinkedList {
public:
    class Node; // Forward declaration
protected:
    Node* head;
    Node* tail;
    int count;
public:
    DLinkedList();
    ~DLinkedList();
    void    add(const T &e);
    void    add(int index, const T &e);
    int     size();
public:
    class Node
    {
    private:
        T data;
        Node *next;
        Node *previous;
        friend class DLinkedList<T>;

    public:
        Node()
        {
            this->previous = NULL;
            this->next = NULL;
        }

        Node(const T &data)
        {
            this->data = data;
            this->previous = NULL;
            this->next = NULL;
        }
    };

};
```


In this exercise, we have include <iostream>, <string>, <sstream> and using namespace std.

For example:

Test	Result

`DLinkedList<int> list;`
`int size = 10;`
`for(int idx=0; idx < size; idx++){`
`  list.add(idx);`
`}`
`cout << list.toString();`
	`[0,1,2,3,4,5,6,7,8,9]`

Test	Result

DLinkedList<int> list;
int size = 10;
for(int idx=0; idx < size; idx++){
  list.add(0, idx);
}
cout << list.toString();
	[9,8,7,6,5,4,3,2,1,0]

Answer: (penalty regime: 0, 0, 0, 5, 10 %)

Reset answer

```
template <class T>
void DLinkedList<T>::add(const T& e) {
    /* Insert an element into the end of the list. */
    Node* newNode = new Node(e);
    if(count == 0){
        head = tail = newNode;
        count++;
    }
    else{
        tail->next = newNode;
        newNode->previous = tail;
        tail = newNode;
        count++;
    }

}

template<class T>
void DLinkedList<T>::add(int index, const T& e) {
    /* Insert an element into the list at given index. */
    Node* newNode = new Node(e);
    if(count == 0){
        head = tail = newNode;
        count++;
        return;
    }
    //at head
    if(index == 0){
        newNode->next = head;
        head->previous = newNode;
        head = newNode;
        count++;
        return;
    }
    //at tail
    if(index == count){
        tail->next = newNode;
        newNode->previous = tail;
        tail = newNode;
        count++;
        return;
    }
    Node* tmpNode;
    int i;
    if(index >= count/2){
        tmpNode = tail;
        i = count-1;
        while(i!=index){
            tmpNode = tmpNode->previous;
```

	Test	Expected	Got	

✔	`DLinkedList<int> list;`
	`int size = 10;`
	`for(int idx=0; idx < size; idx++){`
	`  list.add(idx);`
	`}`
	`cout << list.toString();`
		`[0,1,2,3,4,5,6,7,8,9]`	`[0,1,2,3,4,5,6,7,8,9]`	✔

✔	`DLinkedList<int> list;`
	`int size = 10;`
	`for(int idx=0; idx < size; idx++){`
	`  list.add(0, idx);`
	`}`
	`cout << list.toString();`
		`[9,8,7,6,5,4,3,2,1,0]`	`[9,8,7,6,5,4,3,2,1,0]`	✔

Passed all tests! ✔

Chính xác

Điểm cho bài nộp này: 1,00/1,00.

Câu hỏi 2

Chính xác

Điểm 1,00 của 1,00

Implement methods **get, set, empty, indexOf, contains** in template class D**LinkedList (which implements List ADT)** representing the singly linked list with type T with the initialized frame. The description of each method is given in the code.

```
template <class T>
class DLinkedList {
public:
    class Node; // Forward declaration
protected:
    Node* head;
    Node* tail;
    int count;
public:
    DLinkedList();
    ~DLinkedList();
    void    add(const T &e);
    void    add(int index, const T &e);
    int     size();
    bool    empty();
    T       get(int index);
    void    set(int index, const T &e);
    int     indexOf(const T &item);
    bool    contains(const T &item);
public:
    class Node
    {
    private:
        T data;
        Node *next;
        Node *previous;
        friend class DLinkedList<T>;

    public:
        Node()
        {
            this->previous = NULL;
            this->next = NULL;
        }

        Node(const T &data)
        {
            this->data = data;
            this->previous = NULL;
            this->next = NULL;
        }
    };

};
```


In this exercise, we have include <iostream>, <string>, <sstream> and using namespace std.

For example:

Test	Result

DLinkedList<int> list;
int size = 10;
for(int idx=0; idx < size; idx++){
  list.add(idx);
}
for(int idx=0; idx < size; idx++){
  cout << list.get(idx) << " |";
}
	0 |1 |2 |3 |4 |5 |6 |7 |8 |9 |

DLinkedList<int> list;
int size = 10;
int value[] = {2,5,6,3,67,332,43,1,0,9};
for(int idx=0; idx < size; idx++){
  list.add(idx);
}
for(int idx=0; idx < size; idx++){
  list.set(idx, value[idx]);
}
cout << list.toString();
	[2,5,6,3,67,332,43,1,0,9]

Answer: (penalty regime: 0, 0, 0, 5, 10 %)

Reset answer

```
template<class T>
T DLinkedList<T>::get(int index) {
    /* Give the data of the element at given index in the list. */
    if(index == 0) return head->data;
    if(index == count-1) return tail->data;
    Node* tmpNode;
    int i;
    if(index >= count/2){
        tmpNode = tail;
        i = count-1;
        while(i!=index){
            tmpNode = tmpNode->previous;
            i--;
        }
    } else {
        tmpNode = head;
        i = 0;
        while(i!=index){
            tmpNode = tmpNode->next;
            i++;
        }
    }
    return tmpNode->data;

}

template <class T>
void DLinkedList<T>::set(int index, const T& e) {
    /* Assign new value for element at given index in the list */
    Node* tmpNode;
    int i;
    if(index >= count/2){
        tmpNode = tail;
        i = count-1;
        while(i!=index){
            tmpNode = tmpNode->previous;
            i--;
        }
    } else {
        tmpNode = head;
        i = 0;
        while(i!=index){
            tmpNode = tmpNode->next;
            i++;
```

```
        }
    }
    tmpNode->data = e;
}

template<class T>
```

	Test	Expected	Got	

✔	DLinkedList<int> list;
	int size = 10;
	for(int idx=0; idx < size; idx++){
	  list.add(idx);
	}
	for(int idx=0; idx < size; idx++){
	  cout << list.get(idx) << " |";
	}
		0 |1 |2 |3 |4 |5 |6 |7 |8 |9 |	0 |1 |2 |3 |4 |5 |6 |7 |8 |9 |	✔

✔	DLinkedList<int> list;
	int size = 10;
	int value[] = {2,5,6,3,67,332,43,1,0,9};
	for(int idx=0; idx < size; idx++){
	  list.add(idx);
	}
	for(int idx=0; idx < size; idx++){
	  list.set(idx, value[idx]);
	}
	cout << list.toString();
		[2,5,6,3,67,332,43,1,0,9]	[2,5,6,3,67,332,43,1,0,9]	✔

Passed all tests! ✔

Chính xác

Điểm cho bài nộp này: 1,00/1,00.

Câu hỏi 3

Chính xác

Điểm 1,00 của 1,00

Implement Iterator class in class DLinkedList.

Note: Iterator is a concept of repetitive elements on sequence structures. Iterator is implemented in class vector, list in STL container in C++ (https://www.geeksforgeeks.org/iterators-c-stl/). Your task is to implement the simple same class with iterator in C++ STL container.

```
template <class T>
class DLinkedList
{
public:
    class Iterator; //forward declaration
    class Node;     //forward declaration
protected:
    Node *head;
    Node *tail;
    int count;
public:
    DLinkedList() : head(NULL), tail(NULL), count(0){};
    ~DLinkedList();
    void add(const T &e);
    void add(int index, const T &e);
    T removeAt(int index);
    bool removeItem(const T &item);
    bool empty();
    int size();
    void clear();
    T get(int index);
    void set(int index, const T &e);
    int indexOf(const T &item);
    bool contains(const T &item);
    string toString();
    Iterator begin()
    {
        return Iterator(this, true);
    }
    Iterator end()
    {
        return Iterator(this, false);
    }
public:
    class Node
    {
    private:
        T data;
        Node *next;
        friend class DLinkedList<T>;
    public:
        Node()
        {
            next = 0;
        }
        Node(Node *next)
        {
            this->next = next;
        }
        Node(T data, Node *next = NULL)
        {
            this->data = data;
            this->next = next;
        }
    };
    class Iterator
    {
    private:
        DLinkedList<T> *pList;
        Node *current;
        int index; // is the index of current in pList
    public:
        Iterator(DLinkedList<T> *pList, bool begin);
        Iterator &operator=(const Iterator &iterator);
        void set(const T &e);
```

```
        T &operator*();
        bool operator!=(const Iterator &iterator);
        void remove();

        // Prefix ++ overload
        Iterator &operator++();

        // Postfix ++ overload
        Iterator operator++(int);
    };
};
```

Please read example carefully to see how we use the iterator.

For example:

Test	Result

`DLinkedList<int> list;`
`int size = 10;`
`for(int idx=0; idx < size; idx++){`
`  list.add(idx);`
`}`
`DLinkedList<int>::Iterator it = list.begin();`
`for(; it != list.end(); it++)`
`{`
`  cout << *it << " |";`
`}`
	`0 |1 |2 |3 |4 |5 |6 |7 |8 |9 |`

`DLinkedList<int> list;`
`int size = 10;`
`for (int idx = 0; idx < size; idx++)`
`{`
`  list.add(idx);`
`}`
 	
`DLinkedList<int>::Iterator it = list.begin();`
`while (it != list.end())`
`{`
`  it.remove();`
`  it++;`
`}`
`cout << list.toString();`
	`[]`

`DLinkedList<int> list;`
`int size = 10;`
`for (int idx = 0; idx < size; idx++)`
`{`
`  list.add(idx);`
`}`
 	
`DLinkedList<int>::Iterator it = list.begin();`
`for(; it != list.end(); it++)`
`{`
`  it.remove();`
`}`
`cout << list.toString();`
	`[]`

Answer: (penalty regime: 0, 0, 0, 5, 10 %)

Reset answer

```
1  /*
2   * TODO: Implement class Iterator's method
3   * Note: method remove is different from SLinkedList, which is the advantage of DLinkedList
4   */
5  template <class T>
6  DLinkedList<T>::Iterator::Iterator(DLinkedList<T> *pList, bool begin)
```

```
{
    this->pList = pList;
    if(begin == true){
        this->current = (pList == nullptr)? nullptr : pList->head;
        this->index = (pList == nullptr)? -1 : 0;
    }
    else{
        this->current = nullptr;
        this->index = (pList == nullptr)? 0 : pList->size();
    }
}

template <class T>
typename DLinkedList<T>::Iterator& DLinkedList<T>::Iterator::operator=(const DLinkedList<T>::Iterator &iterat
{
    this->pList = iterator.pList;
    this->current = iterator.current;
    this->index = iterator.index;
    return *this;

}

template <class T>
void DLinkedList<T>::Iterator::set(const T &e)
{
    if(current == nullptr) throw std::out_of_range("Segmentation fault!");
    this->current->data = e;
}

template<class T>
T& DLinkedList<T>::Iterator::operator*()
{
    if(current == nullptr) throw std::out_of_range("Segmentation fault!");
    return this->current->data;
}

template<class T>
void DLinkedList<T>::Iterator::remove()
{
    /*
    * TODO: delete Node in pList which Node* current point to.
    *       After that, Node* current point to the node before the node just deleted.
    *       If we remove first node of pList, Node* current point to nullptr.
    *       Then we use operator ++, Node* current will point to the head of pList.
    */
    if(current == nullptr) throw std::out_of_range("Segmentation fault!");
    if(index == 0){
        current = nullptr;
        index--;
        pList->removeAt(0);
        return;
    }
    /*Node* tmp = pList->head;
    while(tmp->next != current) tmp = tmp->next;*/
    current = current->previous;
    pList->removeAt(index);
    //current = tmp;
    index--;

}

template<class T>
bool DLinkedList<T>::Iterator::operator!=(const DLinkedList::Iterator &iterator)
{
    if(this->current == iterator.current && this->index == iterator.index) return false;
    return true;
}
```

	Test	Expected	Got	

✔	DLinkedList<int> list;
	int size = 10;
	for(int idx=0; idx < size; idx++){
	    list.add(idx);
	}
	DLinkedList<int>::Iterator it = list.begin();
	for(; it != list.end(); it++)
	{
	    cout << *it << " |";
	}
		0 |1 |2 |3 |4 |5 |6 |7 |8 |9 |	0 |1 |2 |3 |4 |5 |6 |7 |8 |9 |	✔

✔	DLinkedList<int> list;
	int size = 10;
	for (int idx = 0; idx < size; idx++)
	{
	    list.add(idx);
	}
	
	DLinkedList<int>::Iterator it = list.begin();
	while (it != list.end())
	{
	    it.remove();
	    it++;
	}
	cout << list.toString();
		[]	[]	✔

✔	DLinkedList<int> list;
	int size = 10;
	for (int idx = 0; idx < size; idx++)
	{
	    list.add(idx);
	}
	
	DLinkedList<int>::Iterator it = list.begin();
	for(; it != list.end(); it++)
	{
	    it.remove();
	}
	cout << list.toString();
		[]	[]	✔

Passed all tests! ✔

Chính xác

Điểm cho bài nộp này: 1,00/1,00.

Câu hỏi 4

Chính xác

Điểm 1,00 của 1,00

Implement methods **removeAt, removeItem, clear** in template class **SLinkedList (which implements List ADT)** representing the singly linked list with type T with the initialized frame. The description of each method is given in the code.

```
template <class T>
class DLinkedList {
public:
    class Node; // Forward declaration
protected:
    Node* head;
    Node* tail;
    int count;
public:
    DLinkedList();
    ~DLinkedList();
    void    add(const T &e);
    void    add(int index, const T &e);
    int     size();
    bool    empty();
    T       get(int index);
    void    set(int index, const T &e);
    int     indexOf(const T &item);
    bool    contains(const T &item);
    T       removeAt(int index);
    bool    removeItem(const T &item);
    void    clear();
public:
    class Node
    {
    private:
        T data;
        Node *next;
        Node *previous;
        friend class DLinkedList<T>;

    public:
        Node()
        {
            this->previous = NULL;
            this->next = NULL;
        }

        Node(const T &data)
        {
            this->data = data;
            this->previous = NULL;
            this->next = NULL;
        }
    };

};
```


In this exercise, we have include <iostream>, <string>, <sstream> and using namespace std.

For example:

Test	Result

DLinkedList<int> list;
int size = 10;
int value[] = {2,5,6,3,67,332,43,1,0,9};
 	
for(int idx=0; idx < size; idx++){
  list.add(value[idx]);
}
list.removeAt(0);
cout << list.toString();
	[5,6,3,67,332,43,1,0,9]

Answer: (penalty regime: 0 %)

Reset answer

```
template <class T>
T DLinkedList<T>::removeAt(int index)
{
    /* Remove element at index and return removed value */
    if(count == 1){
        T val = head->data;
        delete head;
        count--;
        head = tail = nullptr;
        return val;
    }
    //head
    if(index == 0){
        T val = head->data;
        Node* tmp = head;
        head = head->next;
        head->previous = nullptr;
        delete tmp;
        count--;
        return val;
    }
    //tail
    if(index == count -1){
        T val = tail->data;
        Node* tmp = tail;
        tail = tail->previous;
        tail->next = nullptr;
        delete tmp;
        count--;
        return val;
    }
    //
    Node* tmp;
    int i;
    if(index >= count/2){
        tmp = tail;
        i = count-1;
        while(i!= index){
            tmp = tmp->previous;
            i--;
        }
    } else {
        tmp = head;
        i = 0;
        while(i!=index){
            tmp = tmp->next;
            i++;
        }
    }
```

	Test	Expected	Got	

✔	DLinkedList<int> list;
	int size = 10;
	int value[] = {2,5,6,3,67,332,43,1,0,9};
	
	for(int idx=0; idx < size; idx++){
	  list.add(value[idx]);
	}
	list.removeAt(0);
	cout << list.toString();
		[5,6,3,67,332,43,1,0,9]	[5,6,3,67,332,43,1,0,9]	✔

Passed all tests! ✔

Chính xác

Điểm cho bài nộp này: 1,00/1,00.

Câu hỏi 5

Chính xác

Điểm 1,00 của 1,00

In this exercise, we will use Standard Template Library List (click open in other tab to show more) to implement a Data Log.

This is a simple implementation in applications using undo and redo. For example in Microsoft Word, you must have nodes to store states when Ctrl Z or Ctrl Shift Z to go back or forward.

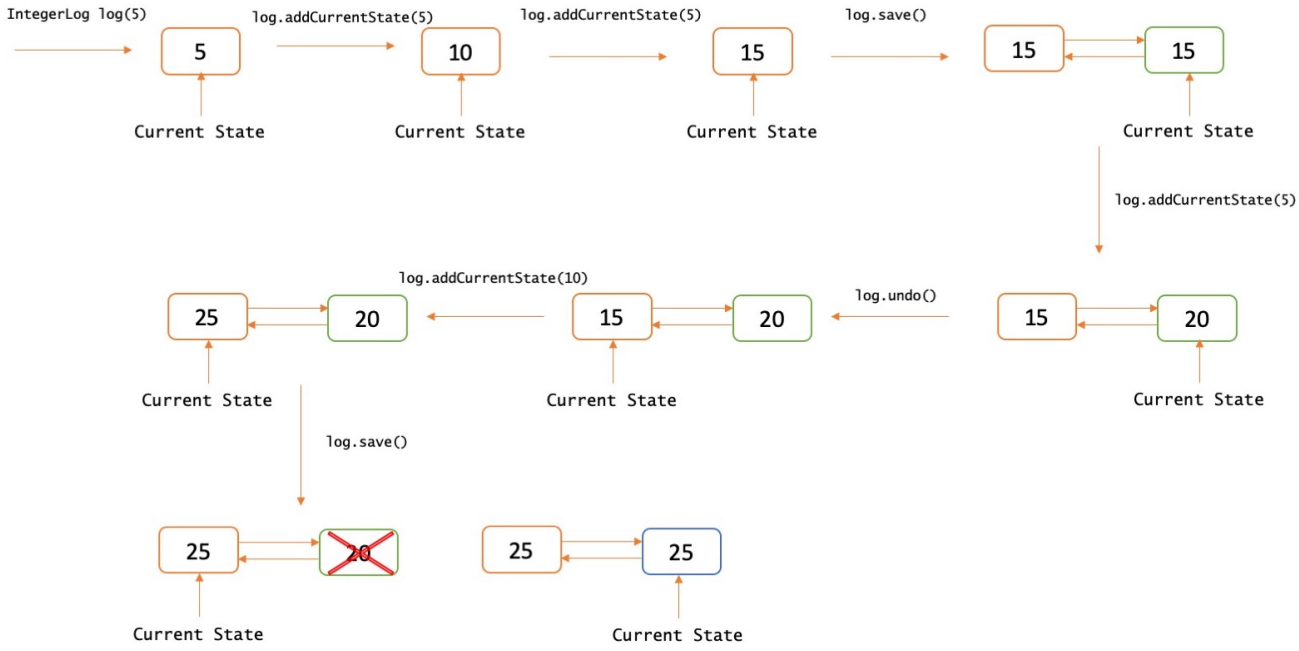
DataLog has a doubly linked list to store the states of data (an integer) and iterator to mark the current state. Each state is stored in a node, the transition of states is depicted in the figure below.

Your task in this exercise is implement functions marked with /* * TODO */.

```
class DataLog
{
private:
    list<int> logList;
    list<int>::iterator currentState;

public:
    DataLog();
    DataLog(const int &data);
    void addCurrentState(int number);
    void subtractCurrentState(int number);
    void save();
    void undo();
    void redo();

    int getCurrentStateData()
    {
        return *currentState;
    }

    void printLog()
    {
        for (auto i = logList.begin(); i != logList.end(); i++) {
            if(i == currentState) cout << "Current state: ";
            cout << "[ " << *i << " ] => ";
        }
        cout << "END_LOG";
    }
};
```


Note: Normally, when we say a List, we talk about doubly linked list. For implementing a singly linked list, we use forward list.

We have include <iostream> <list> and using namespace std;



For example:

Test	Result

DataLog log(10);
log.save();
log.addCurrentState(15);
log.save();
log.addCurrentState(15);
log.undo();
log.printLog();
	[10] => Current state: [25] => [40] => END_LOG

DataLog log(10);
log.save();
log.addCurrentState(15);
log.save();
log.addCurrentState(15);
log.save();
log.subtractCurrentState(5);
log.printLog();
	[10] => [25] => [40] => Current state: [35] => END_LOG

Answer: (penalty regime: 0, 0, 0, 5, 10 %)

Reset answer

```
DataLog::DataLog()
{
    /*
     * TODO:  add the first state with 0
     */
     logList.push_back(0);
     currentState = logList.begin();
}

DataLog::DataLog(const int &data)
{
    /*
     * TODO:  add the first state with data
     */
     logList.push_back(data);
     currentState = logList.begin();
```

```
}

void DataLog::addCurrentState(int number)
{
    /*
     * TODO: Increase the value of current state by number
     */
     *currentState += number;
}

void DataLog::subtractCurrentState(int number)
{
    /*
     * TODO: Decrease the value of current state by number
     */
     *currentState -= number;
}

void DataLog::save()
{
    /*
     * TODO: This function will create a new state, copy the data of the currentState
     *       and move the currentState Iterator to this new state. If there are other states behind the
     *       currentState Iterator, we delete them all before creating a new state.
     */
     //list<int>::iterator i = currentState;
     //i++;
     while (currentState != prev(logList.end(),1)){
         logList.pop_back();
     }
     logList.push_back(*currentState);
     currentState++;
}
```

	Test	Expected	Got	

✔	DataLog log(10);
	log.save();
	log.addCurrentState(15);
	log.save();
	log.addCurrentState(15);
	log.undo();
	log.printLog();
		[10] => Current state: [25] => [40] => END_LOG	[10] => Current state: [25] => [40] => END_LOG	✔

✔	DataLog log(10);
	log.save();
	log.addCurrentState(15);
	log.save();
	log.addCurrentState(15);
	log.save();
	log.subtractCurrentState(5);
	log.printLog();
		[10] => [25] => [40] => Current state: [35] => END_LOG	[10] => [25] => [40] => Current state: [35] => END_LOG	✔

Passed all tests! ✔

Chính xác

Điểm cho bài nộp này: 1,00/1,00.

Câu hỏi 6

Chính xác

Điểm 1,00 của 1,00

Given the head of a doubly linked list, two positive integer a and b where a <= b. Reverse the nodes of the list from position a to position b and return the reversed list

Note: the position of the first node is 1. It is guaranteed that a and b are valid positions. You MUST NOT change the val attribute in each node.

```
struct ListNode {
    int val;
    ListNode *left;
    ListNode *right;
    ListNode(int x = 0, ListNode *l = nullptr, ListNode* r = nullptr) : val(x), left(l), right(r) {}
};
```

Constraint:
1 <= list.length <= 10^5
0 <= node.val <= 5000
1 <= left <= right <= list.length

Example 1:
Input: list = {3, 4, 5, 6, 7} , a = 2, b = 4
Output: 3 6 5 4 7

Example 2:
Input: list = {8, 9, 10}, a = 1, b = 3
Output: 10 9 8

For example:

Test	Input	Result

int size;
cin >> size;
int* list = new int[size];
for(int i = 0; i < size; i++) {
cin >> list[i];
}
int a, b;
cin >> a >> b;
unordered_map<ListNode*, int> nodeValue;
ListNode* head = init(list, size, nodeValue);
ListNode* reversed = reverse(head, a, b);
try {
printList(reversed, nodeValue);
}
catch(char const* err) {
cout << err << '\n';
}
freeMem(head);
delete[] list;
	5
	3 4 5 6 7
	2 4
		3 6 5 4 7

Test	Input	Result

int size;
cin >> size;
int* list = new int[size];
for(int i = 0; i < size; i++) {
cin >> list[i];
}
int a, b;
cin >> a >> b;
unordered_map<ListNode*, int> nodeValue;
ListNode* head = init(list, size, nodeValue);
ListNode* reversed = reverse(head, a, b);
try {
printList(reversed, nodeValue);
}
catch(char const* err) {
cout << err << '\n';
}
freeMem(head);
delete[] list;
	3
	8 9 10
	1 3
		10 9 8

Answer: (penalty regime: 0 %)

Reset answer

```
/*
struct ListNode {
    int val;
    ListNode *left;
    ListNode *right;
    ListNode(int x = 0, ListNode *l = nullptr, ListNode* r = nullptr) : val(x), left(l), right(r) {}
};
*/

ListNode* reverse(ListNode* head, int a, int b) {
    if(a==b) return head;
    int i = 1;
    ListNode* tmpH = head;
    while(i != a){
        tmpH = tmpH->right;
        i++;
    }
    int j = i;
    ListNode* tmpT = tmpH;
    while(j!=b){
        tmpT = tmpT->right;
        j++;
    }
    //store
    ListNode* tmpA = tmpH->left;
    ListNode* tmpB = tmpT->right;

    if(tmpH->left != nullptr) tmpH->left->right = nullptr;
    if(tmpT->right !=nullptr) tmpT->right->left = nullptr;
    tmpH->left = nullptr;
    tmpT->right = nullptr;
    //isolation tmpT
    ListNode* tmpNode = tmpT->left;
    ListNode* currentNode = tmpT;
    tmpT->left = nullptr;
    while(tmpNode!=nullptr){
        ListNode* leftTmp = tmpNode->left;
        tmpNode->right = nullptr;
        tmpNode->left = currentNode;
```

	Test	Input	Expected	Got	

✔	int size;
	cin >> size;
	int* list = new int[size];
	for(int i = 0; i < size; i++) {
	cin >> list[i];
	}
	int a, b;
	cin >> a >> b;
	unordered_map<ListNode*, int> nodeValue;
	ListNode* head = init(list, size, nodeValue);
	ListNode* reversed = reverse(head, a, b);
	try {
	printList(reversed, nodeValue);
	}
	catch(char const* err) {
	cout << err << '\n';
	}
	freeMem(head);
	delete[] list;
		5
		3 4 5 6 7
		2 4
			3 6 5 4 7	3 6 5 4 7	✔

✔	int size;
	cin >> size;
	int* list = new int[size];
	for(int i = 0; i < size; i++) {
	cin >> list[i];
	}
	int a, b;
	cin >> a >> b;
	unordered_map<ListNode*, int> nodeValue;
	ListNode* head = init(list, size, nodeValue);
	ListNode* reversed = reverse(head, a, b);
	try {
	printList(reversed, nodeValue);
	}
	catch(char const* err) {
	cout << err << '\n';
	}
	freeMem(head);
	delete[] list;
		3
		8 9 10
		1 3
			10 9 8	10 9 8	✔

Passed all tests! ✔

Chính xác

Điểm cho bài nộp này: 1,00/1,00.

LIÊN HỆ

268 Lý Thường Kiệt, P.14, Q.10, TP.HCM

(028) 38 651 670 - (028) 38 647 256 (Ext: 5258, 5234)

elearning@hcmut.edu.vn